



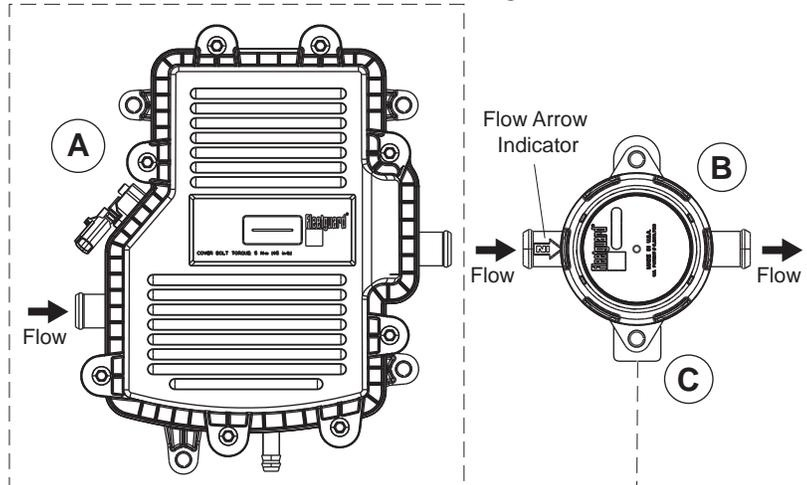
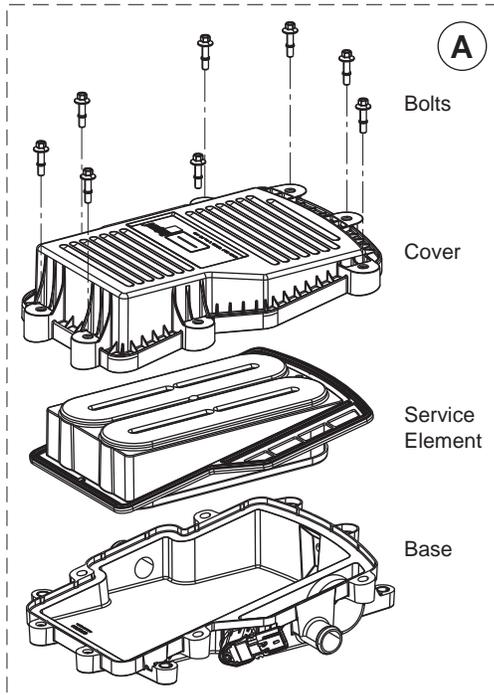
# Filtration

## Crankcase Filtration Kit CV50638 Installation Instructions

### Parts List

Part	Description	No. Included
A	Coalescer Assembly (includes Bolts, Cover, Service Element and Base)	1
B	CDR Valve	1
C	CDR Valve Mounting Bracket	1
D	1/2" to 3/8" Drain Line with Check Valve	1
E	Installation Instructions	1

**IMPORTANT!** The Flow Arrow Indicator on the inlet of Part B must be aligned with direction of flow through the system as shown in the figure below.



### Additional Required Materials

- CDR Valve Mounting Fasteners – 5/16" (8 mm) Nuts and Bolts
- 1" (25 mm) Hose (20R3)
- 3/8" (10 mm) Hose Barb Insert
- 3/8" (10 mm) ID Hose (SAE 30R7)
- 1/2" (13 mm) Hose Clamps
- 90° Hose Connectors
- Cable Ties
- 1" (25 mm) Hose Clamps

### Tools Required

- Hose Cutter
- Ratchet and Socket Set
- Torque Wrench

**Note:** Depending on your application, other components and tools might be required to install this Cummins Filtration CCV system on your application.

**CAUTION:** These instructions are intended for use by professional mechanics who are trained in the proper use of power and hand tools, using appropriate safety precautions (including eye protection).

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## About This Manual

Read the entire document carefully prior to installing your Cummins Filtration Closed Crankcase Ventilation (CCV) system. It is imperative that you pay attention to the alerts that highlight important topics and steps about the installation, operations, and maintenance of the Cummins Filtration CCV system. The following types of alerts appear in this manual:

**Note:** Provides important additional information.

**⚠ CAUTION:** Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, or alerts against unsafe practices, or alerts against actions that could damage the product.

Contact your Cummins Filtration distributor, dealer or Cummins Filtration, Inc. if you have questions regarding the installation.

## Introduction

This Cummins Filtration Closed Crankcase Ventilation (CCV) system is designed to remove emissions from the open crankcase system on a variety of diesel engines with blow-by flows of 12 ft<sup>3</sup>/min or less. Along with reducing emissions, this system helps to reduce oil consumption, mist, fumes and drips in the engine compartment, resulting in a cleaner and safer operating environment.

The gases that are vented out though the crankcase are the result of leakage around the piston rings in the combustion chamber and are composed of hydrocarbon particles, soot from diesel, engine oil, and its contaminants. These crankcase gases are then vented back into the air intake system to be consumed by the combustion process.

The Cummins Filtration CCV system is capable of vastly reducing the amount of contaminants circulated back into the air intake for a wide variety of today's diesel engines, keeping the turbocharger and heat exchangers clean and performing well. For school buses, the filter should be checked and serviced once every year or 1500 hours, whichever occurs first.

**Note:** For stationery powered applications, transit buses, refuse trucks, and for on-highway applications, the filter should be replaced every 1000 hours. Filter replacement information in the remainder of this manual refers to school bus applications only.

To maintain a vehicle's optimal performance, and in order to operate under warranty, please follow these Cummins Filtration installation recommendations.

**⚠ CAUTION:** Follow instructions for installation. The Cummins Filtration installation requirements **MUST** be met to maintain full warranty coverage.

## Pre-Installation Requirements

Mounting this CCV system directly to the engine can cause failures, due to the vibration and movement during normal engine operation. Cummins Filtration recommends this system be mounted in alternate locations, such as the fender, frame rails, or engine bay panels, using pre-existing or newly-fabricated brackets. The ability to service and access the CCV system should be taken into consideration when determining your application's mounting location.

The coalescer unit must be mounted vertically within  $\pm 15^\circ$ . During operation the coalescer should not exceed a  $45^\circ$  angle from vertical. This ensures the proper draining of oil from the coalescer back into the engine.

**⚠ CAUTION:** Mount the coalescer at the proper height. The coalescer's drain port **MUST** be mounted 10"-14" (25-35 cm) above the check valve in the drain line to ensure adequate draining back to the engine. The check valve and drain back location must also be as low as possible, yet still be above full oil level mark.

**⚠ CAUTION:** Mount the coalescer in a protected location. It is important to mount the CCV system so it is not exposed to rain, snow, or extreme temperatures. This exposure could result in a malfunction of the CCV system.

**⚠ CAUTION** All rubber and silicone hoses within the CCV and air intake system between the crankcase valve cover and the inlet of the engine must be oil resistant.

## Typical Installation

This Cummins Filtration CCV system requires the four connections described below in order to function properly. Installation time is approximately four hours, but can vary depending on the application. The first of the fleet installations typically are more time consuming as the technician learns all the facets of the installation.

1. **Coalescer Inlet:** The engine's crankcase breather outlet should be connected to the inlet of the coalescer unit, with 1" (25 mm) ID tubing. Use 1" (25 mm) hose clamps on both ends of the hose and tighten them to secure the connection.
2. **Coalescer Drain:** The drain port of the coalescer should be connected to the supplied 1/2" (13 mm) tubing with a check valve on the end. This line should be installed with the check valve at the bottom, near the drain port on the engine. Proper orientation of the valve allows flow from the coalescer's drain to the engine, but blocks flow from the engine into the coalescer. The drain connection on the engine needs to be within  $\pm 45^\circ$  of vertical, and below the coalescer housing by 10"-14" (25-35 cm), to allow the oil to drain properly. Typical engine drain locations are available on unused low pressure engine block ports, dip-stick holes, or by welding a 3/8" (10 mm) adapter to the oil fill neck.
3. **Coalescer Outlet and Crankcase Depression Regulator (CDR) Valve Inlet:** The line coming from the coalescer outlet should be connected to the 1" (25 mm) inlet of the CDR valve. The inlet is labeled as IN on the port along with a diagram on the bottom of the CDR valve. The valve is necessary to ensure that the air pressure in the system is regulated properly.
4. **CDR Valve Outlet:** The CDR valve's outlet should be connected using a 1" (25 mm) hose back to your air intake ducting, after the air filter but before the turbocharger. The hose can be connected to an unused port, to a T-style connecting coupler, or to a hose barb that was welded onto a metal section of the air intake ducting. When welding on hose barbs, make sure the welds are leak free and all the shavings and debris are removed before starting the engine in order to avoid damaging components.

**⚠ CAUTION:** Use oil resistant hose or tubing. All hose and tubing material must be able to withstand engine oil and the engine bay's heat environment.

**⚠ CAUTION:** Minimize sharp bends and lengths of hoses and tubing. Sharp bends in the hose and tubing should be avoided at all times, and the lengths of the hoses should be kept to a minimum for each installation.

**⚠ CAUTION:** Avoid low spots in hoses or tubing. When hose or tubing has dips or low spots, oil is able to collect and pool, leading to blocked lines. These blocked lines can raise the pressure in the crankcase, which may result in those seals leaking oil.

**⚠ CAUTION:** Check the dip-stick seal. If the engine utilizes a sealed dip-stick, make sure the seal is intact or oil may be forced out of the engine at that point.

### **Ensuring the System is Leak Free**

To be fully effective, all the connecting hoses and tubing should be in good condition and leak free. The system should be inspected regularly for any leaks, damages, or material defects. Those issues should be corrected by replacing worn or damaged parts with new ones.

### **System Maintenance**

Cummins Filtration recommends that the coalescer filter be serviced once every year or 1500 hours, whichever occurs first. The vehicle maintenance records should be updated to include a reminder to check and change the filter every year or 1500 hours, whichever occurs first.

**⚠ CAUTION:** Check and replace filter regularly. The coalescer filter should be checked and replaced in accordance with Cummins Filtration's recommendation of every year or every 1500 hours, whichever occurs first. A filter left unchecked and unchanged can result in lower efficiencies and fouling of the turbocharger and heat exchanger. A plugged filter can also cause the crankcase pressure to rise.

## **CCV System Installation**

This section identifies the installation procedures for the Cummins Filtration Coalescing Crankcase Ventilation system. Please review all the pre-installation requirements and installation procedures before proceeding with the installation.

### **Locating and Mounting the CCV System**

1. Locate and identify possible mounting locations for the Cummins Filtration Coalescing Crankcase Ventilation system, and a potential oil drain back location into the engine. The coalescer assembly's drain port must be at least 10"-14" (25-35 cm) above the check valve in the oil drain line. The coalescer's drain port must also be within  $\pm 15^\circ$  of vertical and must be the lowest point of the part. The system must be mounted near the engine at least 6" (15 cm) away from major heat sources like the turbocharger or exhaust manifold, and not experience temperatures over 250°F (125°C). Before selecting your final location, make sure the system will be accessible for service and periodic checks.

**⚠ CAUTION:** Mount the coalescer at the proper height. The coalescer's drain port **MUST** be mounted 10"-14" (25-35 cm) above the check valve in the drain line to ensure adequate draining back to the engine. The check valve and drain back location must also be as low as possible, yet still be above full oil level mark.

**⚠ CAUTION:** Secure hoses and tubing. The hoses and tubing lines should be secured to keep them out of the way. Cable ties are a good way to keep the movement from vibration to a minimum.

**⚠ CAUTION:** Mount the coalescer in a protected location. It is important to mount the CCV system so it is not exposed to rain, snow, or extreme temperatures. This exposure could result in a malfunction of the CCV system.

**⚠ CAUTION:** Mount CCV system away from heat sources. The CCV system and hoses **MUST** maintain a distance of at least 6" (15cm) from the turbocharger, exhaust manifold, and other major heat sources. The working temperature range for the system is -40 to 250°F (-40 to 125°C).

2. Secure the coalescer and CDR valve to the existing or newly fabricated brackets and mount them to an independent structure such as the engine bay panels, frame, or fenders. Fabrication of custom brackets for mounting may be needed depending on your application. When fabricating brackets, be sure to space the parts out enough to fit the hoses and take clamps on and off, and to remain away from moving parts and hoses.
3. Tighten the mounting bolts securely.



*Figure 1 – Possible Mounting Locations in the Engine Bay*



*Figure 2 – Possible Mounting Location in the Engine Bay with the System in Place*



*Figure 3 – Possible Mounting Location for New Brackets in the Engine Bay*



*Figure 4 - Coalescer Mounted on a Bracket Connected to a Frame Member*

### **Coalescer and CDR Valve Connections**

1. Determine the length of 1" (25mm) hose needed to run from the crankcase vent to the coalescer inlet while making sure to minimize the length and avoiding sharp bends and dips in the hose. A different fitting or a transition piece may be needed at the crankcase vent depending on the engine application. Use hose clamps on both ends of every hose, and tighten the clamps to secure them.
2. The outlet port of the coalescer should be connected to the inlet port of the CDR valve using a 1" (25mm) ID hose. Use hose clamps on each end to secure the hose and then tighten each clamp. Make sure the CDR valve is aligned in the proper flow direction as noted on its base.



Figure 5 – Coalescer Inlet Connecting to Crankcase



Figure 6 – Connecting the Coalescer Unit to the CDR Valve

### Connecting the CDR Valve to the Air Intake System

1. Locate the port on the air intake piping. If there is an extra port then remove the plug and install an adapter to connect to the coalescer outlet hose. If no extra port exists, use either a T connecting coupler, or weld a 1" (25 mm) tube adapter onto a metal section of the air intake piping. Make sure to clean out the debris in the intake piping and check to see that the welds are leak free.

**⚠ CAUTION:** Make sure the existing or new intake port is at least 3/4" (19mm) in diameter to ensure proper air flow is maintained.

2. Determine the hose routing and length needed to connect the CDR valve outlet to the air intake piping, between the air filter and the turbocharger. Take care to minimize the length, and to avoid sharp bends and dips in the hose.

3. Connect 1" (25mm) ID hose to the CDR valve outlet and secure with a hose clamp. Run the other end of the hose to the port or adapter connecting back to the air intake system. Tighten down the hose clamps to secure the connections.

**⚠ CAUTION:** Clean air ducts of debris. Welds made on the air intake piping must be leak free to avoid contaminating the engine and turbocharger. Metal shavings, welding debris and dust must be cleared from inside the air piping before the engine is run again. Failure to do so may cause damage to the engine and turbocharger.



Figure 7 – 1" (25 mm) Hose Barb Welded to the Intake Piping for the Return Line

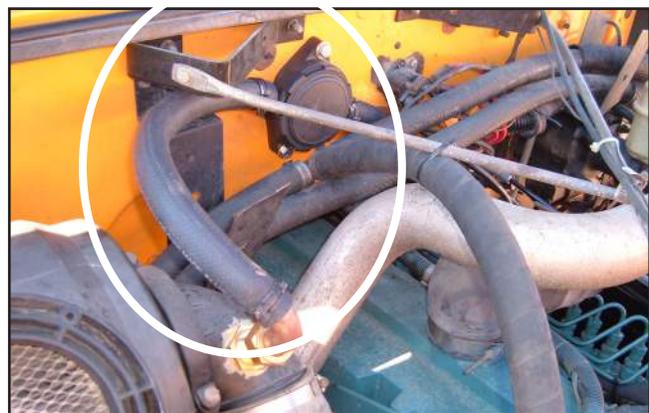


Figure 8 – CDR Valve to Installed Fitting in the Intake Piping Connection

### Connecting the Coalescer Drain to Engine

1. Determine the location for the oil drain return. Locations to consider are unused engine block low pressure ports, dip-stick holes, or welding a 3/8" (10mm) adapter to the oil fill neck. Make sure the port or adapter is positioned upward and within  $\pm 45^\circ$  of vertical, to ensure proper draining. Try to keep the drain location located in the lower section of the engine near the oil pan, yet still be above full oil level mark.
2. Determine the length of tubing in excess of 10" (25mm) that is required to connect the coalescer drain port hose with a check valve to the selected engine drain location. Take care to make sure the check valve is positioned in the correct direction. The grey end of the check valve is the inlet side and the black end is the outlet. The black end must be the closest to the engine drain back location.

**⚠ CAUTION:** Make certain that the check valve allows air to move from the coalescer drain side to the engine side, but not from the engine side to the coalescer drain side. The grey end is the inlet and the black side is the outlet.

3. While the hoses are being connected, place 1/2" (13mm) hose clamps on each ends of the hoses and tighten them down to secure the clamps and hoses.

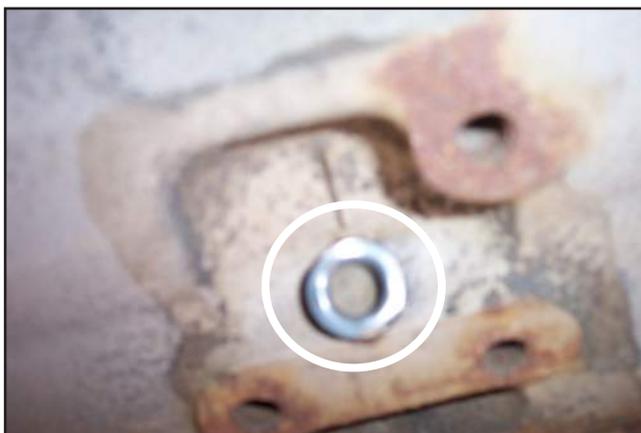


Figure 9 – Possible Drain Location Blocked with a Plug That Can Be Replaced with a Barbed Hose Fitting to Which the Drain Line Can Be Connected



Figure 10 – A Barbed Hose Fitting Welded to the Bottom of the Oil Fill Tube for the Drain Back Location for the Drain Line

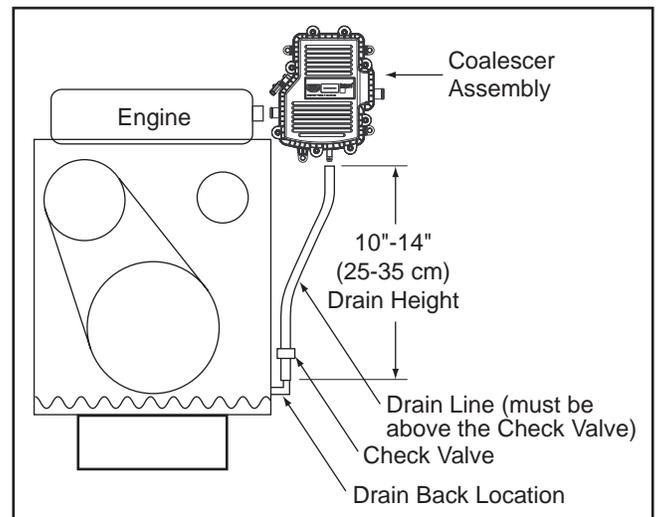


Figure 11 – Drain Height Requirement with Properly Installed Drain Line

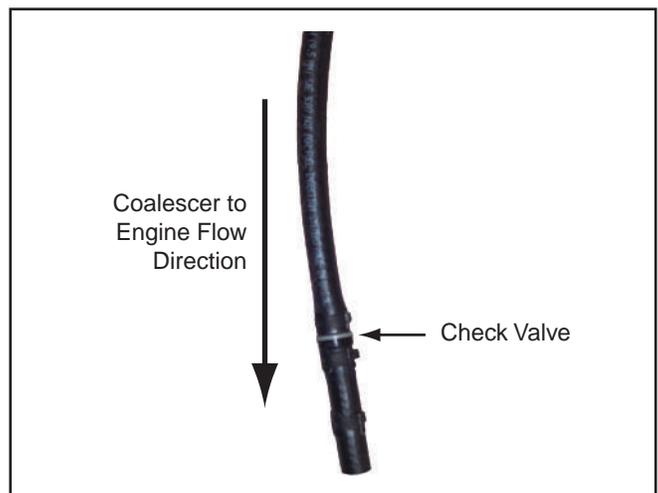


Figure 12 – Coalescer to Engine Flow Direction

## Post Installation Checks

- Make sure that all bolts, fasteners and clamps are tight.
- Make certain that the entire length Drain Line is above the Check Valve.
- Make sure the Flow Arrow Indicator on the CDR valve is correctly aligned with the flow direction of the CV system.
- Start the engine allowing it to idle, and warm up.
- Check for leaks in all hose connections. Tighten clamps as needed.
- Check for leaks in the intake piping.
- Check for leaks at the crankcase vent and oil drain location.
- Turn the engine off.
- Repair all vent leaks, if found, during checks.
- Add filter service note to the service log.

## Routine Service Procedure

Check and replace the coalescer's filter every year or 1500 hours, whichever occurs first, in accordance with the following procedure.

1. Loosen the eight, 5/16" (8 mm) hex head bolts holding the Coalescer cover and base together. Then lift the cover off the base and the bolts should all remain in the cover.
2. Remove the old filter from the base, and insert the new filter, model CV50633, into the base.
3. Place the cover back on the base with new filter in place and tighten the eight bolts to 45 in-lb (5N·m), using a star shaped pattern.
4. Check over the hoses for leaks, failures such as cracking, and loose connections and replace as needed.
5. Taking note of the engine mileage, update the maintenance records accordingly and schedule the next filter replacement.

**⚠ CAUTION:** Use only Cummins Filtration replacement filters in the coalescer unit. Operation of the vehicle without a filter could result in the turbocharger and heat exchanger becoming fouled. Replacement filter: CV50633

**⚠ CAUTION:** The coalescer filter is **NOT CLEANABLE**. Attempting to clean or recondition the coalescer's filter could result in a lower efficiency, fouling of the turbocharger and heat exchanger, and an increase in crankcase pressure.

A check valve is used in this Cummins Filtration Coalescing Crankcase Ventilation system to prevent oil from being drawn up the drain line into the coalescer unit.

The oil dip-stick can act as a pressure relief location and become dislodged from its properly installed position. If the dip-stick becomes dislodged, check the coalescer filter to see if it has become plugged or dirty, and replace if necessary.

## Filter Disposal Information

During normal use, the coalescer's filter collects engine oil, diesel particles, engine wear debris and by-products of combustion. Please dispose of used coalescer filters per local regulations. Treating the used coalescer filter in the same manner as a used oil filter can usually meet local regulations.

## Specifications

Specifications	CV50638
Height Overall	13.7" (347.1 mm)
Depth Overall	3.4" (87.3 mm)
Width, max	11.5" (291.0 mm)
Weight (Dry)	4.52 lbs (2.05 kg)
Nominal Flow Rate	6 ft <sup>3</sup> /min (170 L/min)
Restriction at Nominal Flow	0.3 kPa (1.2 in H <sub>2</sub> O)
Rated Flow Rate	12 ft <sup>3</sup> /min (340 L/min)



**Filtration**

For more information, visit [cumminsfiltration.com](http://cumminsfiltration.com)

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